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Discovery of a Comet by Photography. By E. E. Barnard, M.A.

On October 12 I made an exposure on the Milky Way near and west of α *Aquilæ* of 4 hours 20 minutes' duration with the Willard lens.

Upon developing the plate I found a distinct hazy trail near the middle of it, and about a quarter of a degree long. By this time the position of the object was too near the horizon to make a search for it. The next night (13th), as soon as it was dark enough, a search was made with the 12-inch, and the object was found nearly a degree south-east of the position on the photograph. A few minutes' observation showed it to be a comet in motion to the south-east. The comet was very faint in the 12-inch, about the thirteenth magnitude, round, and but little brighter in the middle. It has been carefully observed at every opportunity since.

This object is an exact representative of Class I. of short-period comets, very much resembling in appearance D'Arrest's comet.

The micrometer position on October 13 was—

1892 October 13^d 7^h 12^m 29^s Mount Hamilton M.T.

App. $\alpha = 19^h\ 33^m\ 57^s{\cdot}56$

App. $\delta = +12^\circ\ 30'\ 5''{\cdot}0$

From the faintness of the comet in the telescope, and the strength of its trail in the plate, it is evident that its light is mainly actinic. The plate used was a Cramer "Lightning," a very rapid and fine plate.

Mount Hamilton:
1892 *October* 24.

Note on the Period and Distance of the Fifth Satellite of Jupiter.
By E. E. Barnard, M.A.

This satellite was discovered here by the writer at midnight, 1892, September 9, with the 36-inch equatoreal.

From the eastern elongations of September 10 and October 21 the following periodic time results: $11^h\ 57^m\ 20^s{\cdot}5$. Hourly motion $30^\circ{\cdot}111$.

The period of $17^h\ 36^m$ distributed in Europe was an error in telegraphic transmission. The period of $11^h\ 50^m$ sent later was erroneously derived from the observed distances of the satellite.

From seven eastern observed elongations the distance of the satellite (at east elongation) is $48''{\cdot}094$ (at 5.20). This corresponds to a distance from *Jupiter's* centre of 112,510 miles. The few observed western elongations give a distance about

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1″ less than this, and there is evidently sensible ellipticity to the orbit.

At present the satellite is assumed to be of the 13th magnitude. Under the most favourable conditions it has not been possible to see the shadow of this object when in transit. From these and other considerations the satellite is probably not over 100 miles in diameter. Taking everything into consideration the brightness at east and west elongations is the same.

Mount Hamilton:
1892 *October* 24.

P.S.—Following are two of the last observed *east elongations* of the satellite:—

1892.	d	h	m	
Oct.	21	17	2·8	G.M.T. computed from measures before and after elongation.
	23	16	49·0	„ „ „ „

The measured distance at east elongation of the 23rd was—

62″·90

October 26.

On the Sidereal Period of the New Satellite of Jupiter.
By the Rev. A. Freeman, M.A.

Upon examination of Professor E. E. Barnard's most important paper upon the "Discovery and Observation of a Fifth Satellite of Jupiter," published in No. 275 of the *Astronomical Journal*, for October 4, 1892, it seems probable that an error has been made in deducing the period from the concluded apparent distances of the satellite at its elongations, September 10, 12, and 14. Professor Barnard employs the formula—

$$P = p\sqrt{\frac{m}{M} \cdot \frac{R^3}{r^3}},$$

in which he states that m is the mass of the Earth, and M that of *Jupiter*, p and r the periodic time and geocentric radius of our Moon, P and R the periodic time and jovicentric radius of the new satellite. But, if he had desired to compare the period with that of our Moon, he ought to have employed the formula,

$$P = p\sqrt{\frac{m + m^1}{M + m_0} \cdot \frac{R^3}{r^3}},$$

in which $m^1 = \frac{1}{81}m$ (nearly) is the mass of the Moon, and m_0 is the mass of the new satellite, so small as to be neglected in comparison with the mass of *Jupiter*. Unless, therefore, the "*mass of the Earth*" meant by Mr. Barnard includes that of the Moon also, his resulting period is manifestly and decidedly too small.

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